UNIVERSITY OF SASK
ELECTRICAL ENGINE

Assignment Q
January 21, 2

Instructor: B.L. Daku
Time: 10 minutes
Aids: None

Name:
Student Number:

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1. Determine the constant β, where

$$\beta = \frac{\cos(\omega_0(n+1)) + \cos(\omega_0(n-1))}{\cos(\omega_0 n)}.$$

What could this expression be used for if you were given three consecutive samples of a discrete-time signal? to get ω_0

$$= \frac{\frac{1}{2}\left(e^{j\omega_0 n + j\omega_0} + e^{-j\omega_0 n - j\omega_0}\right) + \frac{1}{2}\left(e^{j\omega_0 n - j\omega_0} + e^{-j\omega_0 n + j\omega_0}\right)}{\frac{1}{2}\left(e^{j\omega_0 n} + e^{-j\omega_0 n}\right)}$$

$$= \frac{e^{j\omega_0 n} e^{j\omega_0} + e^{-j\omega_0 n} e^{-j\omega_0} + e^{j\omega_0 n} e^{-j\omega_0} + e^{-j\omega_0 n} e^{j\omega_0}}{e^{j\omega_0 n} + e^{-j\omega_0 n}}$$

$$= \frac{e^{j\omega_0 n}\left[e^{j\omega_0} + e^{-j\omega_0 n} e^{-j\omega_0} + e^{-j\omega_0} + e^{-j\omega_0 n} e^{j\omega_0}\right]}{e^{j\omega_0 n}\left[1 + e^{-j2\omega_0 n}\right]}$$

$$= \frac{e^{j\omega_0}\left[1 + e^{-j2\omega_0 n}\right] + e^{-j\omega_0}\left[1 + e^{-j2\omega_0 n}\right]}{\left[1 + e^{-j2\omega_0 n}\right]}$$

$$= e^{j\omega_0} + e^{-j\omega_0} = 2\cos(\omega_0) = \beta$$